Lab

11

Chemical Bonding: Polarity of Slime and Silly Putty

*TN Standard **3.1**: Investigate chemical bonding. Students will distinguish between polar and non-polar molecules.*

Have you ever read the newspaper using silly putty?

Newsprint can be transferred to silly putty. This oddity is due to the chemical characteristic called polarity. Polarity is based on two primary factors, electronegativity and the shape of the molecule. Polarity is an important aspect of chemistry, and it is apparent everywhere. Loads of household substances are examples of both polar and nonpolar molecules. To explore polarity, let's experiment with two favorite toys—slime and silly putty!

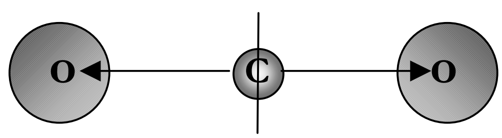
Introduction

The root word for polarity is "pole". There are strong attractions in a molecule that induce poles, similar to the North and South poles of the earth or a magnet. A molecule can be polar too. Whether a molecule is polar or nonpolar is primarily based on electronegativity and the shape of the molecule.

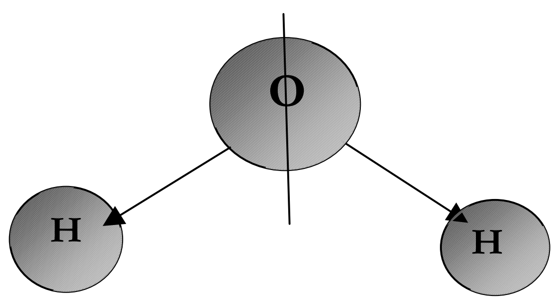
Electronegativity is a term that describes the attraction an atom has for electrons. Fluorine has the strongest attraction for electrons, and, therefore, has the greatest electronegativity. Elements on the right side of the Periodic Table, close to where fluorine is located, have larger electronegativities than elements located on the left side of the Periodic Table. If all of the atoms in a molecule have similar electronegativities, the molecule is non-polar. Hexane is an example of a non-polar molecule. It has only carbon and hydrogen atoms. The electronegativities of carbon and hydrogen atoms are very similar. They have only a 0.4 difference in their electronegativity values.

If there is a large difference between the electronegativities of two covalently bonded atoms, the bond is polar. For a covalent bond to be considered polar, the atoms bonded together must have an electronegativity difference between 0.5 and 1.9. But even if a molecule has a bond between two atoms with this much electronegativity difference, it does not automatically mean that the molecule is polar. The shape of a molecule also has to be considered.

To understand how the shape of the molecule affects the polarity, imagine the atoms within a molecule playing tug-of-war. If there is an equal pull on each side, the rope does not move. Similarly, if there are two polar bonds that have equal electronegativity differences, they each pull with the same force, and the overall pull is zero.



An example of this is CO_2. In this case, there are two polar bonds, but the molecule is non-polar because the overall pull is zero. If there is an unequal net pull, however, the molecule is polar. Water is an example of this. It has a bent shape so the pull is unequal.



Polar molecules such as water, vinegar, or ethanol dissolve other polar molecules. Non-polar molecules, such as oil or gasoline, dissolve other non-polar molecules. This trend is known as **"like dissolves like."** Since sugar dissolves in water, is sugar polar or non-polar? If you said polar, you are correct. Sugar is a polar molecule since it is dissolved in water, a polar molecule.

Paper chromatography is a laboratory technique that uses **"like dissolves like"** to separate different chemicals. A sample is first spotted on an absorbent paper such as filter paper and allowed to dry. A solvent is then allowed to travel up the paper by capillary action. The components of the sample most like the solvent will stay dissolved in the solvent more than on the paper and travel farther up the paper. The components that are least like the solvent will travel the least or not at all.

Some inks are polar, while others are non-polar. A polar substance will pick up water-soluble inks by dissolving the ink. Likewise a non-polar substance will pick up water-insoluble inks by dissolving the ink. In this lab you will use inks to identify slime and silly putty as polar or non-polar. You will also use paper chromatography to verify that the inks are correctly identified as polar or non-polar.

Objectives

- Compare and contrast the chemical bonding properties of slime and silly putty.
- Demonstrate knowledge gained about polar and non-polar bonding through supporting or rejecting your hypothesis about which inks will be absorbed.
- Learn about the technique of chromatography and how it is often used to separate the components of a mixture based on their polarity.

Name:______________________________ **Date:**__________ **Period:**________

Pre-lab Questions

1. What two conditions are considered when determining whether a molecule is polar or non-polar?

2. What determines if a bond is polar?

3. List examples of polar molecules.

4. List examples of non-polar molecules.

5. What is the rule when using polar and non-polar solvents?

Procedure

SAFETY FEATURES

- Glassware
- Safety Goggles

MATERIALS NEEDED

- Borax solution (4%)
- Guar gum powder
- Silly putty
- Notebook paper
- Newspaper
- Variety of inks: Ball point pens, Sharpies, Highlighters, and Dry erase markers
- 10 and 100 mL Graduated Cylinder s
- 250 mL beaker
- Filter paper (fast)
- Stirring rod
- Spatula
- Balances
- Water, distilled
- Zip lock plastic bag

Part 1. Making Slime

1. If slime is provided, go to Part 2. If it is not provided, weigh out 0.5 g of guar gum powder into a 250 mL beaker.
2. Measure 50 mL of distilled water into a 100 mL graduated cylinder. Pour it into the 250 mL beaker that contains the guar gum powder.
3. Rapidly stir the mixture with a stirring rod until the guar gum powder is dissolved.
4. Measure 5.00 mL of a 4% borax solution into a 10 mL graduated cylinder. Add it to the guar gum and water.
5. Stir the solution until it becomes slime. This will take a few minutes. If the slime remains too runny, add 1.0 mL of the 4.0% borax solution and continue to stir until the slime is the right consistency.
6. Once you are satisfied with the slime, pour it into your hands. Be sure not to drop any of it onto the floor.
7. Manipulate the slime in your hands. Write down observations made about how slime pours, stretches, breaks, etc. **CAUTION: Slime is slippery, and if dropped, it can make the work area slick.**
8. Place the slime back into the beaker, and WASH YOUR HANDS.

Part 2. Slime and Silly Putty Ink Tests

1. On a piece of notebook paper, make one 20-25 mm long mark of each of the inks you are testing. Space the marks at least one inch apart. Use a pencil to label each mark with its description.
    - **Water-soluble inks** include a highlighter and a black ball point pen.

- **Water-insoluble inks** include a Sharpie pen/marker, newsprint, and a dry-erase marker.

2. Let the ink marks dry completely.

3. While the inks are drying, select a passage or a picture in the newspaper to test with the slime.

4. Break off a small piece of slime that is 3-5 cm in diameter. Gently place this piece on top of the newspaper ink, and then carefully pick it up again.

5. Observe and record whether the ink was picked up onto the slime.

6. Break off another small piece of slime. Gently place it on top of the first dried ink on the notebook paper, and then carefully pick it up. Repeat this for each of the inks.

7. Observe and record which inks were picked up (dissolved) by the slime in Table 1. Repeat this ink testing two more times for accuracy.

8. Store the slime in a zip lock plastic bag.

9. Before performing ink tests on silly putty, hypothesize which inks the silly putty will pick up. Write your hypothesis in the data section.

10. Perform ink tests on silly putty in the same manner as above.

11. Record results in Table 2.

Part 3. Chromatography of Ink Samples

1. Use a pencil or scissors to poke a **small** hole in the center of a piece of filter paper (see Figure 1).

2. Spot the filter paper, evenly spaced ~3 cm from the small hole, with the two insoluble inks and the two soluble inks that were used in Part 2.

3. Obtain a ½ piece of filter paper. Fold the paper in half several times so that it makes a narrow wick.

4. Insert the wick into the hole of the spotted paper so that it is above the top of the filter paper by ~2 cm.

5. Fill a 250 mL beaker 3/4 full with water.

6. Set the filter paper on top of the beaker so that the bottom of the wick is in the water. The paper should hang over the edge of the beaker with the spotted side up.

7. Allow water to travel until it is ~1 cm from the edge of the filter paper. Remove the filter paper from the beaker.

8. Observe which inks moved from where they were originally spotted. Record your observations in Part 3 of the Data section below.

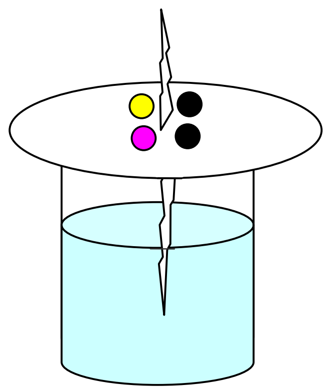


Figure 1: Chromatography Apparatus

Name:______________________________ **Date:**__________ **Period:**________

Lab Partner:_________________________

Data

Part 1.

Observations for Slime (if slime is made)

Part 2.

Table 1. Results of Ink Testing for Slime

Name of Ink	Picked up (dissolved)			Did not pick up (dissolve)		
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
Newsprint						
Highlighter						
Black ball point pen						
Sharpie marker						
Dry-erase marker						

❖ Hypothesis of which inks silly putty will pick up:

Table 2. Results of Ink Testing for Silly Putty						
Name of Ink	Picked up (dissolved)			Did not pick up (dissolve)		
	Test 1	Test 2	Test 3	Test 1	Test 2	Test 3
Newsprint						
Highlighter						
Black ballpoint pen						
Sharpie marker						
Dry-erase marker						

Part 3.

- Observations of inks following chromatography:

Post Lab Questions

1. Did the slime pick up water-soluble or water-insoluble inks? From these results what can you conclude about the polarity of slime?

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2. Explain how you determined your hypothesis about whether or not silly putty would pick up water. Was your hypothesis correct?

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3. Were the inks you used properly classified as soluble and insoluble? Explain your answer.

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Lab

13

Sugar or Salt?
Ionic and Covalent Bonds

TN Standard ***2.1:*** *The student will investigate chemical bonding.*

Have you ever accidentally used salt instead of sugar?

Drinking tea that has been sweetened with salt or eating vegetables that have been salted with sugar tastes awful! Salt and sugar may look the same, but they obviously taste very different. They are also very different chemically. Salt is made up of sodium and chloride and is ionically bonded. Sugar, on the other hand, is composed of carbon, oxygen, and hydrogen and has covalent bonds.

Introduction

A salt molecule is made up of one sodium atom and one chlorine atom. For salt to be made, the sodium atom must lose an electron and become a sodium ion. When sodium loses an electron, it becomes a Na^+ and is called a **cation**.

$$\mathbf{Na \rightarrow Na^+ + e^-}$$

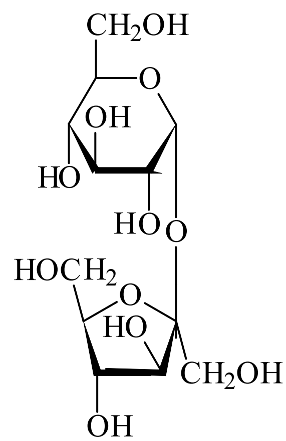
The chlorine atom must add the sodium's electron and become a chloride ion. When it adds the sodium's lost electron, it becomes Cl^- and is called an **anion**.

$$\mathbf{Cl + e^- \rightarrow Cl^-}$$

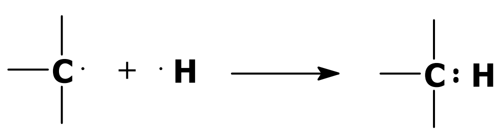
The sodium ion is then attracted to the chloride ion, and a bond is formed from the attraction between a positive and negative ion. This type of bond is called an **ionic bond**. Ionic bonds usually form between metals and non-metals.

$$\mathbf{Na^{+} + Cl^{-} \rightarrow Na^{+}Cl^{-}}$$

Table sugar or sucrose differs from salt in the bonding between its atoms. The atoms in sugar do not form ions; instead, they share their electrons. The type of bond that forms from the sharing of electrons between the atoms of the table sugar is a **covalent bond.** Table sugar has a much more complex chemical structure than salt. It looks like this:



A bond forms between one of the carbon atoms and one of the hydrogen atoms when one of the valence electrons of the carbon atom combines with one of the valence electrons of the hydrogen atom. This forms an electron pair.


(This is normally written C-H.)

Ionically bonded compounds behave very differently from covalently bonded compounds. When an ionically bonded compound is dissolved in water, it will conduct electricity. A covalently bonded compound dissolved in water will not conduct electricity. Another difference is that ionically bonded compounds generally melt and boil at much higher temperatures than covalently bonded compounds.

In the first part of this lab you will investigate how ionically bonded and covalently bonded substances behave differently in their conduction of electricity. You will do this by using a simple anodizing apparatus. A stainless steel screw and an iron nail will be used for the electrodes. In an anodizing apparatus, the water must contain enough ions to conduct electricity. Then the water will react to form hydrogen and oxygen gases.

$$2H_2O \rightarrow 2H_2 + O_2$$

Since the stainless steel screw is not very reactive, bubbles can be seen coming off of it. The iron nail will react with the oxygen to form iron oxide, which is commonly called rust. This can be seen on the nail after the reaction proceeds for several minutes.

In the second part of this lab, you will explore the differences in melting points between ionically bonded and covalently bonded compounds. You will do this by placing a small amount of sugar in one small test tube and heating it over a Bunsen burner. You will then repeat this procedure using salt instead of sugar.

Objectives

- To understand the difference between ionic and covalent bonding.
- To link ionic and covalent bonding with their physical properties.

Date:________ Name:______________________ Period_________

Pre-lab Questions

1. What is an ionic bond?

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2. What is a covalent bond?

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3. Do you think sugar or salt will melt at a higher temperature? Explain your answer.

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Procedure

SAFETY FEATURES

Safety Goggles

MATERIALS NEEDED

- 2 packets of sugar
- 2 packets of salt
- 9-volt battery
- 2 rubber bands
- Deionized water
- 1 Iron nail
- 2 Wire leads with alligator clips on each end
- 1 Stainless steel screw
- 150 mL beaker
- Stirring rod
- 2 small test tubes
- Spatula
- Test tube holder
- Striker
- Bunsen burner
- Sharpie marker
- Ruler

Part 1. Nail Test for Ionic Bonding

1. Rinse a clean 150 mL beaker several times with deionized water to prevent contamination from ions that may be on the beaker. Fill the beaker about ¾ full with deionized water.

2. Pour a packet of sugar (~3 g) into the 150 mL beaker. Stir the solution with a clean stirring rod until the sugar is dissolved and the solution is well mixed.

3. Stretch two rubber bands around the 150 mL beaker. Be careful not to spill any of the solution. The rubber bands should loop from the top to the bottom of the beaker. Position the 2 rubber bands next to each other (Figure 1). **HINT:** Do not position the bands around the circumference of the beaker.

4. Attach the alligator clip on one end of a wire lead to just underneath the flat head of an iron nail. Place the iron nail between the 2 rubber bands on one side of the 150 mL beaker. The end of the nail should be in the solution while the head with clip is resting on the rubber bands.

5. Attach the alligator clip on one end of another wire lead to just below the head of the stainless steel screw. Place the screw between the 2 rubber bands on the opposite side of the 150 mL beaker. Make sure the end of the screw is in the solution and the head with the clip is resting on the rubber bands.

6. Connect the alligator clip on the other end of the wire lead that is attached to the nail to the (+) terminal of a 9-volt battery. **CAUTION**: **Be careful when using energy sources such as batteries around water.**

7. Connect the alligator clip on the other end of the wire lead that is attached to the screw to the (-) terminal of a 9-volt battery. **CAUTION: Be careful when using energy such as batteries around water.**

8. Allow the apparatus to stand for two minutes and make observations. Record your observations in Part 1 of the data section.

9. Thoroughly clean the glassware, nail and screw with deionized water.

10. Repeat the procedure using a packet of salt (~0.65 g) instead of the sugar.

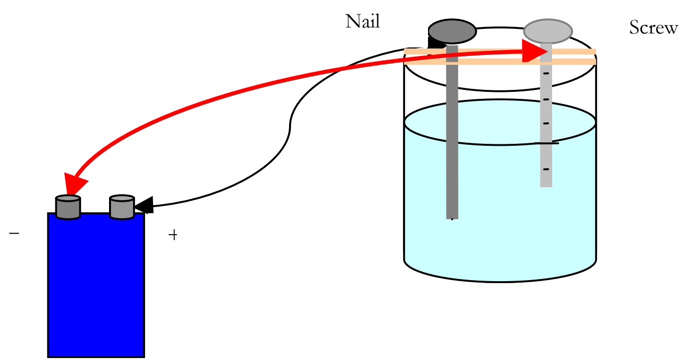

Figure 1. Apparatus for Part 1

Part 2. Melting points

1. Place a spatula tip full of sugar into a small test tube. The sugar should just coat the bottom of the test tube. **CAUTION: Be sure the test tube does not have any small cracks or chips in it.**

2. Light a Bunsen burner and adjust the flame to where it is approximately 2 -3 inches tall and has a blue inner cone. **CAUTION: Long hair should be tied up and loose clothing restrained when around an open flame to prevent fire and burns. Be sure you are wearing your safety goggles.**

3. Place the test tube containing the sugar in a test tube holder. Hold the test tube at a slight angle approximately 4 inches above the top of the burner. Continue to hold the test tube above the flame until the sugar just begins to melt. If it does not melt after ~15 seconds, go on to step **4**. If it has melted, go to step **6**. **HINT:** If you keep the sugar in the flame until it turns dark brown or black, you will not be able to clean the test tube.

4. If the sugar did not melt in step 3, lower the test tube until the bottom of the test tube is touching the top of the flame. Hold it there until the sugar just begins to melt or for ~15 seconds.

5. If the sugar still does not melt, lower the test tube until the bottom of the test tube is located at the top of the inner blue cone of the flame. This is the

hottest part of the flame. Hold it there until the sugar just begins to melt or for ~15 seconds.

6. Allow the test tube to cool to room temperature before touching it. **CAUTION: The test tube will be very hot and can burn your skin if touched before it cools. Hint:** After the test tube has cooled for a few seconds, place it in a beaker or wire test tube rack to finish cooling and continue with the procedure.

7. Record your observations in the data section.

8. Repeat the procedure using salt instead of the sugar.

9. Turn off the Bunsen burner. Make sure the test tubes have cooled to room temperature before touching them. **CAUTION: The test tube will be very hot and can burn your skin if touched before it cools.**

10. Record your observations in the data section.

11. Clean-up: The sugar and salt solutions can be poured down the drain. Rinse the beaker, screw, nail, and stirring rod several times with deionized water. Clean the test tubes with water first, and then rinse them with deionized water. They may need to soak for a few minutes in hot water in order to remove the melted substances.

Date:________ Name: ___________________________ Period:_________

Lab Partner: ___________________________________

Data

Part 1.

- Observations for the sugar solution:

- Observations for the salt solution:

Part 2.

- Observations for the melting of sugar:

- Observations for the melting of salt:

Post Lab Questions

1. Why is deionized water instead of tap water used in Part 1?

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2. In Part 1, why did you not observe a stream of bubbles coming off of the stainless steel screw with the sugar solution?

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3. Why do you think you may see a few bubbles forming in Part 1 with the sugar solution?

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4. In Part 1, why did you observe a stream of bubbles coming off of the stainless steel screw and rust forming on the nail with the salt solution?

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5. In Part 2, which of the substances had the lower melting point? Was this what you expected? Explain your answer.

Lab

22

Properties of Acids and Bases

*TN Standard **4.2**: The student will investigate the characteristics of acids and bases.*

Have you ever brushed your teeth and then drank a glass of orange juice?

What do you taste when you brush your teeth and drink orange juice afterwards. Yuck! It leaves a really bad taste in your mouth, but why? Orange juice and toothpaste by themselves taste good. But the terrible taste results because an acid/base reaction is going on in your mouth. Orange juice is a weak acid and the toothpaste is a weak base. When they are placed together they neutralize each other and produce a product that is unpleasant to taste. How do you determine what is an acid and what is a base? In this lab we will discover how to distinguish between acids and bases.

Introduction

Two very important classes of compounds are acids and bases. But what exactly makes them different? There are differences in definition, physical differences, and reaction differences. According to the Arrhenius definition, acids ionize in water to produce a hydronium ion (H_3O^+), and bases dissociate in water to produce hydroxide ion (OH^-).

Physical differences can be detected by the senses, including taste and touch. Acids have a sour or tart taste and can produce a stinging sensation to broken skin. For example, if you have ever tasted a lemon, it can often result in a sour face. Bases have a bitter taste and a slippery feel. Soap and many cleaning products are bases. Have you accidentally tasted soap or had it slip out of your hands?

Reactions with acids and bases vary, depending on the substances being reacted. Acids and bases react differently. For example, bases do not react with most metals, but an acid will react readily with certain metals to produce hydrogen gas and an ionic compound. An ionic compound is often referred to as a **salt**. An example of this type of reaction occurs when magnesium metal reacts with hydrochloric acid. In this reaction magnesium chloride (a salt) and hydrogen gas are formed.

$$Mg_{(s)} + 2HCl_{(aq)} \rightarrow MgCl_{2\,(aq)} + H_{2(g)}$$

metal + acid → a salt + hydrogen gas

Acids may also react with a carbonate or bicarbonate to form carbon dioxide gas and water. The general reaction equation for a reaction between an acid and a carbonate can be represented in this manner:

$$CO_3^{2-}{}_{(aq)} + 2H_3O^+{}_{(aq)} \rightarrow CO_{2(g)} + 3H_2O_{(l)}$$

carbonate + acid → carbon dioxide + water

The general reaction equation for a reaction between an acid and bicarbonate is similar and can be represented in this manner:

$$HCO_3^-{}_{(aq)} + H_3O^+{}_{(aq)} \rightarrow CO_{2(g)} + 2H_2O_{(l)}$$

bicarbonate + acid → carbon dioxide + water

Acids and bases can also react with each other. When the two opposites react with each other they cancel each other out so that the product formed has neither the acid nor the base properties. This type of reaction is called a **neutralization** reaction. The general reaction equation for the reaction between an acid and a base is represented in this manner:

$$H_3O^+ + OH^- \rightarrow 2H_2O$$

Acid + Base → Water

An example of a neutralization reaction is when an aqueous solution of HCl, a strong acid, is mixed with an aqueous solution of NaOH, a strong base. HCl, when it is in water, forms H_3O^+ and Cl^-. NaOH in water forms Na^+ and OH^-. When the two solutions are mixed together the products are water and common table salt. Neither water nor table salt has acid or base properties. Generally this reaction is written without the water solvent shown as a reactant.

$$HCl + NaOH \rightarrow H_2O + NaCl$$

An aqueous (water) solution with a lot of hydronium ions and very few hydroxide ions is considered to be very acidic. If, instead, an aqueous solution has a lot of hydroxide ions and very few hydronium ions, it is considered to be very basic. Acids and bases are measured on a scale called pH. The pH is the negative log of the hydronium ion concentration.

$$pH = -\log[H_3O^+]$$

pH ranges from less than 1 to 14. It lets us quickly tell if something is very acidic, a little acidic, neutral (neither acidic nor basic), a little basic or very basic. A pH of 1 is highly acidic, a pH of 14 is highly basic, and a pH of 7 is neutral.

pH indicators, litmus paper, and pH paper can be used to determine whether something is an acid or a base, as well as the strength of its acidity or basicity. An indicator is a substance that turns a different color at a certain pH. Litmus paper is a form of an indicator. It is made by coating paper with the indicator litmus. Litmus is known to change color at a pH of about 7. Either red or blue litmus paper can be purchased. Blue litmus paper remains blue when dipped in a base, but it turns red when an acid touches it. Red litmus paper stays red when dipped in an acid, but turns blue when a base touches it.

Another way to more specifically determine an acid or base is through the use of pH paper. pH paper allows us to determine to what degree a substance is acidic or basic. When a substance is placed on pH paper, a color appears. The color is compared to a color chart, showing the color the pH paper will turn at different pH values.

In this experiment, we will observe the neutralization of acids and bases, using grape juice as an indicator, and an acid-base reaction of a bicarbonate. We will also test common household products for their acidity or basicity.

Objectives

- To understand the properties and reactions of acids and bases.
- To relate these properties to common household products.

Date:________ Name:______________________ Period:_________

Pre-lab Questions

1. What is a neutralization reaction?

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2. Hydrochloric acid (HCl) is a strong acid. About what pH would you expect it to be?

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3. Sodium hydroxide (NaOH) is a strong base. About what pH would you expect it to be?

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Procedure

SAFETY FEATURES

- Safety Gloves
- Safety Goggles

MATERIALS NEEDED

- Welch's Grape Juice
- 3 medium-sized test tubes
- 1 M HCl
- 1 M NaOH
- 2 droppers
- Stirring rod
- 25 mL graduated cylinder
- 100 mL beaker
- Balance
- pH paper
- Red and blue litmus paper
- Sodium bicarbonate (baking soda)
- Distilled water
- Universal indicator
- Vinegar
- Tomato juice

Part 1: Acid-Base Neutralization

1. Label 3 medium-sized test tubes **1**, **2**, and **Standard**.

2. Pour 10 mL of the dilute grape juice solution into each test tube.

3. Note the color of the juice in the test tube labeled **standard** in Table 1.

4. Add 10 drops of 1M HCl into test tube **1.** Record your observations concerning the color change in Table 1 of the data section. Use the juice in the test tube labeled **standard** for comparison.

5. Add 10 drops of 1M NaOH into test tube **2**. Record your observations concerning the color change in Table 1 of the data section. Use the juice in the test tube labeled **standard** for comparison.

6. Use pH paper to determine the pH of the solution in each of the 3 test tubes. Record the pH values in Table 1.

7. Add drops of 1M NaOH to test tube **1** until it returns to its original color. Record your observations in Table 2.

8. Add drops of 1M HCl to test tube **2** until it returns to its original color. Record your observations in Table 2.

9. Use pH paper to test the pH of the 3 solutions. Record the pH values in Table 2.

Part 2: Acid / Bicarbonate Reaction

1. Weigh out 0.5 grams of sodium bicarbonate into a 100 mL beaker.

2. Add 3 mL of distilled water to the beaker, and stir until most of the sodium bicarbonate is dissolved.

3. Add ~3 drops of universal indicator to the beaker. Compare the color of the solution to the pH paper indicator chart. Record the color and corresponding pH in Table 3.

4. Measure 10 mL of vinegar into a graduated cylinder.

5. Add ~3 drops of the universal indicator to the vinegar. Compare the color of the solution to the pH paper indicator chart. Record the color and corresponding pH in Table 3.

6. Use a dropper to add 3 mL of the vinegar in the 10 mL graduated cylinder into the sodium bicarbonate solution. Note the color change and pH in Table 3 under "Mixture."

7. Add 3 mL increments of the vinegar into the sodium bicarbonate and vinegar mixture until the solution's color changes and becomes neutral. Note the color and pH in Table 3 under "Additional vinegar".

Part 3: Testing acidity and basicity of common household products

1. Use the clean droppers to put two drops of each of the following items into different wells of your spot plate: tomato juice, household ammonia, milk, vinegar, lemon juice, and dilute dishwashing liquid. Be sure to label or write down where each item is located in the spot plate. **CAUTION: Do not contaminate the items being tested. Be sure to use only the designated dropper for each item.**

2. Guess the pH of each of the items before you find the experimental value, and record your guess in Table 4.

3. Test each item with litmus paper and pH paper. Record your results in Table 4.

4. To clean up, rinse all chemicals into a waste beaker. Neutralize the waste to a pH between 4 and 8, using either baking soda or vinegar. Wash the waste solution down the drain.

Date:________ Name: __________________________ Period:_________

Lab Partner: ____________________________________

Data

Table 1: Acid-Base Neutralization

	Test tube 1	Test tube 2	Standard
Step 1	Add acid	Add base	Neutral
Color			
pH			

Table 2: Acid-Base Neutralization

	Test tube 1	Test tube 2	Standard
Step 1	Add base	Add acid	Neutral
Color			
pH			

Table 3: Acid Base Reactions

Substance	Color	pH
Sodium bicarbonate		
Vinegar		
Mixture		
Additional vinegar		

Table 4: Testing for acidity and basicity in common household products

Product	Hypothesized pH	Color of Litmus Paper	Color of pH Paper	Actual pH

Post Lab Questions

1. Why did the grape juice change color when an acid or base was added?

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2. You added a base, NaOH, to test tube **1** that contained HCl and an acid to test tube **2** that contained base. Why did the grape juice return to its original color?

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3. In part 2 of the procedure, universal indicator was added in the reaction. Why was it added?

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4. Name 2 acids and 2 bases you encounter everyday.

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